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ABSTRACT

The reliability and validity of the State-Trait Anxiety Inventory for Children (STAIC) was studied with 675 adolescents aged 12 to 18 recruited from clinical and community sources. The STAIC is a self-report measure that has been widely used to assess state and trait anxiety of children. It has been suggested that the child version may be more useful with adolescent populations than the adult version. A three-factor solution fit the data better than a two-factor solution. The correlations between factor loadings and item response theory (IRT) slopes ranged between 0.95 and 0.98, and all of the items of the STAIC were highly discriminating. Scores from factor loadings, scores from the IRT slopes, and summary scores discriminated the groups with or without an anxiety disorder. Results from the confirmatory factor analysis and reliability study indicated that the STAIC was applicable to adolescents. (Contains 2 tables and 14 references.) (Author/SLD)

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Reliability and Validity of the State-Trait Anxiety Inventory for Children in an Adolescent Sample: Confirmatory Factor Analysis and Item Response Theory

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Abstract

The reliability and validity of the State-Trait Anxiety Inventory for Children (STAIC) was studied with 675 adolescents. The correlations between factor loadings and IRT slopes ranged between 0.95 and 0.98.

Index terms: STAIC, CFA, IRT

The State-Trait Anxiety Inventory for Children (STAIC; Spielberger, 1973) is a self-report measure which has been widely used to assess state and trait anxiety of children. Normative data on the STAIC are available for fourth, fifth, and sixth grade students (approximately 8 to 12 years old: Spielberger, 1973). However, the scale has also been used with adolescents (Hoehn-Saric, Maisami, & Wiegand, 1987; Strauss, Last, Hersen, & Kazdin, 1988; Clark, Turner, Biedel, Donovan, Kirisci, & Jacob, 1994). It has been suggested that the child version of STAI may be more useful for adolescent populations than the adult version, given that even older adolescents may have difficulty understanding some of the vocabulary in the adult version (Hoehn-Saric et al., 1987).

The validity and reliability of the STAIC-State and Trait subscales has been supported by several studies with children. Evidence for the construct validity of the STAIC-State subscale has been presented. Scores increase when children are asked to report their imagined responses just before a final exam in an important subject compared with baseline reports Spielberger (1973). The mean STAIC-State scores have also been reported higher in anxiety provoking test conditions as opposed to baseline conditions (Roberts, Vargo, & Ferguson,1989). They also reported that each item on the scale significantly discriminated between test and baseline conditions. The concurrent validity of the STAIC-Trait scale has been supported by relatively high correlations with other similar measures, including the Children's Manifest Anxiety Scale (CMAS) (r=0.75: Castaneda, McCandless, & Palermo, 1956), the General Anxiety Scale for Children (GASC) (r=0.63: Saranson, Davidson, Lighthall, Waite, & Ruebush, 1960), and the Hamilton Anxiety Rating Scale interview (r=0.58: Clark & Donovan, 1994).

Several authors have provided data concerning Cronbach α reliabilities for the STAIC. Papay and Spielberger (1986) presented Cronbach α reliability coefficients for the STAIC-State

subscale ranging from 0.71 to 0.76, and for the STAIC-Trait subscale ranging from 0.82 to 0.89. In a study with children in third grade and fourth grade, Papay and Hedl (1978) reported Cronbach α reliability coefficients for the STAIC-State subscale ranging from 0.73 to 0.82, and for the STAIC-Trait subscale ranging from 0.59 to 0.71.

Although reliability and validity of the STAIC has been studied with preadolescent children, less is known about its psychometric properties when it is applied to adolescents. The purpose of the study is to determine whether adolescents completing the STAIC provide reliable and valid information about their state and trait anxiety. In addition, the extent to which the STAIC discriminated adolescents with a DSM-III-R (American Psychiatric Association, 1987) diagnosis of an anxiety disorder, adolescents with other psychiatric diagnoses and controls was determined.

METHOD

Subjects. The subjects were 675 adolescents between 12 and 18 years of age (mean=15.20, sd=2.05) recruited from both clinical and community sources. Clinical cases were primarily recruited from inpatient and outpatient psychiatric treatment facilities. Nonclinical subjects were recruited through the use of a telephone sampling frame method by a market research firm and through advertisement.

Females comprised 34.7% (N=234) of the sample. Females had a mean age of 15.7 (sd=1.8) years and a mean socio-economic status level of 38.4 (sd=14.8) (Hollingshead, 1975). Males had a mean age of 14.9 (sd=2.1) years and a mean socio-economic status level of 37.2 (sd=15.1). Education level was 9.1 (sd=1.9) and 7.8 (sd=2.2) years for the females and males

respectively. European-Americans, African-Americans, and others comprised 72.1% (N=487), 25.0% (N=169), and 2.8% (N=19) of the sample, respectively.

A diagnosis of an anxiety disorder was present in 22.7% (N=153) of the total sample. Furthermore, 26.5% (N=179) of the total sample qualified for a diagnosis of substance use disorder, 16.7% (N=113) for major depression, 37.0% (N=250) for conduct disorder, 8.9% (N=60) for attention deficit disorder, and 6.1% (N=41) for oppositional defiant disorder. Diagnoses were considered present where DSM-III-R diagnostic criteria were met within the past 6 months.

Instrumentation. The State-Trait Anxiety Inventory for Children (STAIC) is designed to assess state and trait anxiety for children and contains two scales of 20 items each. The child responds to the STAIC items by selecting one of the alternative responses. Each subscale score ranges from 20 to 60. The STAIC-State scale is constructed to ask children how they feel at a particular moment in time. A sample STAIC-State scale question is "I feel very nervous, nervous, not nervous". The STAIC-Trait scale asks how they generally feel. A sample STAIC-Trait scale question is "I am shy hardly-ever, sometimes, often".

Procedure. First, two- and three-factor models were tested using confirmatory factor analysis. Items within each scale were then separately calibrated using MULTILOG (Thissen, 1991). This procedure was selected because it utilizes the marginal maximum likelihood (MML) method to estimate item parameters within a graded item response model (Samejima, 1969). Finally, Cronbach α and marginal reliability were computed for each scale.

RESULTS

Confirmatory factor analysis. PRELIS (Jöreskog and Sörbom, 1993) was used to generate the polychoric correlation matrix for input to LISREL 8 (Jöreskog & Sörbom, 1993). For the 2-factor model, STAIC-State and STAIC-Trait anxiety, the Chi-square was 653.33 (df=732, p=.98). The adjusted goodness of fit index and root mean square residual were 0.95, 0.068, respectively. In a subsequent analysis, the STAIC-State items were gathered into two groups (1) "anxiety-present" items and (2) "anxiety-absent" items. For the two-state factors and one-trait factor model, the fit was perfect. The Chi-square was 370.49 (df=737, p=1.00). The three-factor model fit the data significantly better than the two-factor model (Change in Chi-square=282.84, df=5, p<.001). The factor loadings for the three-factor model were presented in Table 1.

Insert Table 1

Item response model. Items were then calibrated for each scale separately by using Samejima's graded IRT model. The IRT slopes of each item are presented in Table 1.

Correlation analysis. The correlations between factor loadings and IRT slopes were highly significant. The correlation between factor loadings of the "anxiety-present" items and IRT slopes of the corresponding items was 0.96 (p<.001). The correlation between factor loadings of the "anxiety-absent" items and IRT slopes was 0.95 (p<.001), and finally, factor loadings of the trait subscale and IRT slopes was 0.98 (p<.001).

Reliability of the STAIC. The reliability coefficient of each scale was calculated based on the item response theory and the classical measurement theory. The marginal reliability

coefficients were 0.82 for the STAIC-State-Anxiety Present scale, 0.80 for the STAIC-State Anxiety Absent scale and 0.91 for the STAIC-Trait scale. The classical reliability coefficient (Cronbach α) was 0.87 and 0.89 for the STAIC-State Anxiety Present and STAIC-State Anxiety Absent scales, respectively. The Cronbach α was 0.88 for the STAIC-Trait scale.

Group comparison. The next analysis was directed to determine the extent to which the STAIC discriminated adolescents with a DSM-III-R defined diagnosis of an anxiety disorder from adolescents with other psychiatric disorders and adolescents with no psychiatric disorders (normals). The results were presented in Table 2. ANOVA was computed on the scores based on factor loadings, scores based on IRT slopes (item discrimination parameters) and STAIC summary scores. As can be seen in Table 2, the three groups were discriminated at beyond the 0.0001 level of significance. Furthermore, all pairwise group comparisons were significant at 0.05 level according to Scheffe's procedure.

Insert Table 2

CONCLUSION

This psychometric investigation of the STAIC in an adolescent sample yielded several important results. First, it was found that a 3-factor solution fit the data better than a 2-factor solution. Second, the STAIC had desirable level of reliability when administered to adolescents. Third, all of the items of the STAIC were highly discriminating. In summary, the results of the confirmatory factor analsysis and reliability study indicated that the STAIC was applicable to adolescents. Finally, scores obtained from factor loadings, scores obtained from IRT slopes and STAIC summary scores discriminated the groups with or without an anxiety disorder.

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Table 1. Factor loadings and IRT slopes of the 40-item State-Trait Anxiety Inventory for Children.

STAIC Scales	Response Category			Factor loadings (λ)	IRT slopes (a)
STAIC-State: How do you feel right now, at this moment?					
STAIC-State: "Anxiety-Present"					
1. I feel	very calm	calm	not calm	0.51	1.58
3. I feel	very pleasant	pleasant	not pleasant	0.65	2.07
6. I feel	very rested	rested	not rested	0.48	1.12
8. I feel	very relaxed	relaxed	not relaxed	0.62	1.87
10. I feel	very satisfied	satisfied	not satisfied	0.68	2.17
12. I feel	very happy	happy	not happy	0.74	2.54
13. I feel	very sure	sure	not sure	0.68	2.20
14. I feel	very good	good	not good	0.76	2.71
17. I feel	very nice	nice	not nice	0.69	2.14
20. I feel	very cheerful	cheeful	not cheeful	0.72	2.18
STAIC-State: "Anxiety-Absent"					
2. I feel	very upset	upset	not upset	0.66	2.40
4. I feel	very nervous	nervous	not nervous	0.48	1.12
5. I feel	very jittery	jittery	not jittery	0.48	0.86
7. I feel	very scared	scared	not scared	0.72	2.07
9. I feel	very worried	worried	not worried	0.75	2.46
11. I feel	very frightened	frightened	not frightened	0.75	2.64
15. I feel	very troubled	troubled	not troubled	0.78	2.87
16. I feel	very bothered	bothered	not bothered	0.70	2.70
18. I feel	very terrified	terrified	not terrified	0.53	1.48
19. I feel	very mixed-up	mixed-up	not mixed-up	0.72	2.50
STAIC-Trait: How do you ususally feel?					
STAIC-Trait	hardly ever	sometimes	often		
1. I worry about making mistakes				0.50	1.39
2. I feel like crying				0.61	1.78
3. I feel unhappy				0.57	1.47
4. I have trouble making up my mind				0.52	1.34
5. It is difficult for me to face my problems				0.61	1.77
6. I worry too much				0.70	2.25
7. I get upset at home				0.53	1.35
8. I am shy				0.30	0.60
9. I feel troubled				0.68	2.13
10. Unimportant thoughts run through my mind and bother me				0.59	1.64
11. I worry about school				0.47	1.16
12. I have trouble deciding what to do				0.58	1.65
13. I notice my heart beats fast				0.35	0.82
14. I am secretly afraid				0.61	1.92
15. I worry about my parents				0.42	1.01
16. My hand get sweaty				0.35	0.79
17. I worry about things that may happen				0.61	1.71
18. It is hard for me to fall asleep at night				0.41	0.85
19. I get a funny feeling in my stomach				0.51	1.29
20. I worry about what others think of me				0.57	1.50

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Table2. Comparisons of adolescents with anxiety disorder, with other psychiatric disorder, and normals with respect to scores computed by using factor loadings and IRT slopes.

STAIC Subscales	Score	Adolescents with anxiety disorder Mean (sd) (N=153)	Adolescents with other psychiatric disorders Mean (sd) (N=294)	Adolescents with no psychiatric disorder Mean (sd) (N=228)	F-value (p-value)	Partial η^2
STAIC-State "anxiety-present"	Factor	4.86(2.04)	4.29(1.67)	3.72(1.64)	25.47 (<.0001)	.06
	IRT-slope	21.57(9.19)	18.98(7.46)	16.45(7.31)	25.83 (<.0001)	.06
	Summary score	11.12 (4.19)	9.64(3.50)	8.64(3.40)	21.28(<.00001)	.06
STAIC-State "anxiety-absent"	Factor	7.68(2.08)	8.53(1.30)	8.98(0.69)	55.39 (<.0001)	.12
	IRT-slope	34.86(9.63)	38.83(5.97)	40.93(3.10)	56.60(<.0001)	.13
	Summary score	16.19(4.58)	18.16(2.96)	19.25(1.67)	45.33(<.0001)	.12
STAIC-Trait	Factor	6.76(3.24)	5.01(2.56)	3.63(2.16)	85.98(<.0001)	.19
	IRT-slope	25.94(12.67)	19.09(9.99)	13.68(8.30)	86.96(<.0001)	.19
	Summary score	19.14(8.20)	13.72(6.79)	10.42(6.06)	72.94(<.0001)	.18

Note: All pairwise group comparisons were significant at 0.05 level according to Scheffe procedure